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LABORATORY METHOD OF DETERMINING THE POTENCY OF TYPHOID VACCINE [1]

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The antigenic properties of *E. typhosa* have been examined closely since Grinnell (*1*), in 1932, demonstrated that smoothness of vaccine-producing strains was an essential quality for the protection of mice against virulent typhoid bacilli. Perry, Findlay, and Bensted (*2*, *3*) confirmed this finding and stressed virulence as a requisite quality of the vaccine strain and, in 1934, Felix and Pitt (*4*) described Vi antigen which had been found to be a constituent of typhoid bacilli which were virulent for mice. Extensive studies at the Research Laboratories of the United States Army Medical School (*5*) resulted in the selection of a highly virulent, fully protective strain for vaccine production. This strain, No. 58 (Boxill, chronic carrier, Panama strain), replaced the older "Rawlings" strain as the source organism of typhoid vaccines in the United States.

These developments cast serious doubt on the validity of the existing potency test for typhoid vaccine, a procedure based on the production of agglutinins in rabbits by the injection of vaccine. This test was a measure of the "H" agglutinin content of serum, a value which has been shown to have little or no correlation with the ability of such serum to protect animals (*3*, *6*). Emphasis was placed on methods by which vaccines were assayed on the basis of their ability to protect animals.

Using the mucin technique described by Rake (*7*), the Research Laboratories of the United States Army Medical School developed a serum protection test in mice whereby protective antibodies were readily demonstrated in human serums after the injection of typhoid vaccine. The suspension of living typhoid bacilli in 5 percent mucin permitted the use of a range of test doses from 1 to 100,000 or more mouse lethal doses in evaluating serums. Previously the range of

[1] From Biologics Control Laboratory, National Institute of Health.

challenge doses in active or passive immunization tests was limited by the large numbers of bacilli required to kill mice. Twenty-five to 50 million virulent organisms suspended in saline represented one lethal dose for mice, and multiples of this dose often were extremely toxic. Henderson (*8*) suggested that anti-invasive properties of serum were better measured by the less toxic dose, i. e., smaller numbers of organisms in mucin, and that massive test doses of bacilli suspended in saline measured antitoxic properties of serum.

Evaluation of the potency of vaccine by passive protection tests had two theoretical objections: (1) that important factors contributing to the immune status of actively immunized animals were not subject to study by serum protection tests, and (2) that passive tests, requiring a source for immune serum, introduced into the test a second animal variable.

Active immunization procedures described by Perry and others (*3*, *5*) employed as a challenge dose large numbers of organisms in saline and were subject to the same objection Henderson raised to passive immunity tests, in that larger numbers of organisms were not well fitted to measure anti-invasive immunity. An adaptation of the mucin technique for measuring the ability of typhoid vaccines to actively immunize mice and some factors influencing this procedure are herewith presented.

MATERIALS AND METHODS

Mice.—Three strains of white Swiss mice were used: National Institute of Health, regular, National Institute of Health, brother and sister mating, and CFW. In addition, the susceptibility to typhoid bacilli of albino mice of the agouti crossed strain (ABC–AL), C3H (brown), and C57 (black) strains was examined.

Mucin.—Five percent mucin suspension was prepared as follows: 100 gm. of granular mucin were suspended in 2,000 cc. of distilled water in a large flask. To promote solution the material was heated in a water bath at 57° C. for 1 hour. This viscid suspension was filtered through several layers of gauze and brought to pH 7.2–7.4 with 0.1 N. sodium hydroxide using bromthymol blue as an indicator. The suspension, apportioned in 100 cc. amounts into small flasks, was autoclaved at 15 pounds pressure for 30 minutes. Mucin suspensions were satisfactory for at least 6 months when stored at 5° C.

Test organisms.—Strains of *E. typhosa* suspended in sterile milk were dried in vacuo from the frozen state. A fresh vial was opened on the day before test, the dried culture emulsified with sterile broth, and immediately transferred to meat infusion broth. After 2 hours' incubation at 37° C. a loopful of culture was spread on meat infusion

agar. Growth resulting after 16 to 20 hours at 37° C. was washed from the agar with physiological salt solution, and a suspension prepared having a turbidity equal to 500 parts per million of the silica standard (*9*). From this basic suspension serial tenfold dilutions in saline were made. Test doses were prepared using 5 percent mucin as the diluent in the final tenfold dilution. Pour plate colony counts were made from the 10^{-7} saline dilution. All challenge doses were given intraperitoneally in 0.5-cc. volumes. For convenience this factor of the 0.5-cc. dose was ignored in the tables presented, thus the 10^{-3} dilution actually was equal to 5×10^{-4}, 10^{-4} was equal to 5×10^{-5}, etc. Mice were observed for 72 hours. Strains of *E. typhosa* used were:

(1) *Number 63.*—A typical virulent typhoid bacillus obtained from the United States Army Medical School. This organism is not used in the production of typhoid vaccine by licensed producers. In most of these studies, Number 63 was used as the challenge organism.

(2) *Number 26.*—A virulent strain which has been on laboratory media for at least 10 years.

(3) *Number 23.*—A strain isolated in 1942 which was dried after but few transfers on laboratory media.

Vaccines.—Vaccines were prepared with strain No. 58 (obtained from the United States Army Medical School) and with strain No. 24 (Rawlings strain). The technique described by Holt and Hitchens (*10*) was followed except that the suspensions were diluted with normal saline instead of buffered salt solution.

Alcohol-killed and alcohol-preserved vaccines were prepared, as recommended by Felix (*11*), with strain 58. Other vaccines used in the comparative tests were prepared by licensed laboratories. All vaccines contained 1,000 million organisms per cc. They were proved to be sterile before use. Vaccines were diluted with normal saline when necessary and mice were given doses in 0.5 cc. volume.

Fifty percent end point determinations.—In the calculation of values for protection induced in mice by vaccines, and in determining the lethal dose of the test strain, the 50 percent end point mortality method of Reed and Muench (*12*) was applied.

Rabbit serum.—Two normal rabbits weighing 5 to 6 kg., were given 3 doses (0.5, 1.0, and 1.0 cc. at weekly intervals) of each of 10 undiluted vaccines by the subcutaneous route. One week after the last dose the animals were bled and serums of each pair pooled. These serums were used in comparative, passive protection tests (table 9) (a) by determining the number of lethal doses resisted by mice given 0.1 cc. of serum 1 hour before test (*5*), and (b) by determining the least dose of serum which protected mice against a constant challenge dose of organisms. An illustrative protocol of these procedures is shown in table 1.

TABLE 1.—*Amount of serum of immunized rabbits necessary to protect 50 percent of mice against* E. typhosa

Vaccine used to immunize rabbits	Dose of serum (cc.)	Number of mice	Survivors	Deaths	Accumulated totals			Calculated 50 percent end point of serum
					Survivors	Deaths	Mortality (percent)	
Vaccine "F"	0.006	10	1	9	1	15	93.7	0.025 cc.
	0.025	10	5	5	6	6	50.0	
	0.1	10	9	1	15	1	6.3	
Vaccine "X"	0.006	10	5	5	5	9	64.3	0.013 cc.
	0.025	9	7	2	12	4	25.0	
	0.1	10	8	2	20	2	90.9	
Control (normal rabbit serum)	0.1	10	0	10	----	----	----	Greater than 0.1 cc.

Test organism: Strain 63.
Test dilution: 10^{-4}=32,000 lethal doses.
Mice: Regular strain, 18–20 gms.

Agglutination tests of rabbit serums were made using living antigens. "O" agglutinins were measured with suspensions of strain NIH 730 (901–O), and "H" agglutinins with strain NIH 729 (901–H). Approximately 400 million organisms per cc. were contained in the antigen-serum mixture. The results were read at 2 and at 24 hours after incubation at 37° C., and the greatest dilution showing macroscopic agglutination with definitely less cloudiness of the supernatant as compared to saline controls was recorded as the positive end point. Vi agglutinin titers were determined with suspensions of *S. ballerup* (*13*). Tests were read after incubation for 2 hours at 37° C. and after an additional 22 hours at +5° C. Before vaccine was injected into the rabbits their serums were negative for agglutinins against "O," "H," or Vi antigens when diluted 1:10.

FACTORS INFLUENCING RESULTS OF POTENCY TESTS

1. MICE

(*a*) *Strains of mice.*—White Swiss mice of the National Institute of Health, regular; National Institute of Health, brother and sister mating; and CFW strains were susceptible to the typhoid bacillus, as were the albino ABC–AL, C3H (brown), and C–57 (black) strains of mice. However, as shown in table 2, considerable variation in susceptibility to the test organism was present among strains of mice, and these differences influenced the numbers of lethal doses mice were enabled to resist by vaccination.

The number of immunized mice surviving the 10^{-3} test dose was not appreciably different among the four strains of mice. However, since this dose represented almost ten times as many lethal doses for the CFW strain as for the regular strain, the number of 50 percent lethal doses resisted is greater for the CFW strain.

TABLE 2.—*Influence of strains of mice on results of vaccine potency tests*

Strain of mice	Average weight		Results (Survivors/number mice injected)							Log of dilution 50 percent mortality	50 percent lethal dose resisted by mice given vaccine
			Test dilutions				No vaccine				
	At injection of vaccine (gm.)	At challenge (gm.)	Given 0.05 cc. vaccine "A"								
			10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}		
NIH–Regular	13.5	18.3	0/10	7/10	9/10	10/10	3/10	4/10	10/10	6.889	12,700
ABC–AL	13.5	19.0	0/10	5/10	5/10	9/10	1/9	1/9	5/9	7.724	13,300
NIH–B–S	12.85	18.3	0/10	6/10	8/10	8/10	0/10	2/10	9/10	7.675	29,500
CFW	13.3	17.7	0/10	5/10	8/10	10/10	0/10	1/10	5/10	7.906	51,000

All mice 5–6 weeks old.
Test organism: Strain 63.
Test dose given 14 days after vaccine injection.

(*b*) *Age and weight of mice.*—The number of typhoid bacilli suspended in mucin required to kill 50 percent of mice 5 weeks old was smaller than the number necessary to kill 50 percent of mice 7 or 10 weeks old (table 3). The age factor also affected the number of lethal doses immunized mice resisted. Fifty percent of 10-week-old mice receiving vaccine resisted 95,000 lethal doses whereas 5-week-old mice resisted 36,000 lethal doses, the younger mice not being able to withstand the 10^{-2} test dilution.

TABLE 3.—*Influence of age of mice on results of vaccine potency test*

Age of mice	Average weight		Results (Survivors/number of mice injected)								Log of dilution 50 percent mortality	Number of lethal doses resisted by mice given vaccine
			Test dilutions				No vaccine					
	At injection of vaccine (gm.)	At challenge (gm.)	Given 0.05 cc. vaccine "A"									
			10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}		
5 weeks	9.25	14.3	------	0/10	5/10	7/10	------	1/10	1/9	5/10	7.833	36,000
7 weeks	14.75	18.8	0/8	5/10	5/10	8/10	0/6	2/10	5/10	8/10	7.000	27,000
10 weeks	20.25	22.5	0/10	7/10	8/10	9/10	1/8	3/10	5/10	7/10	6.906	95,000

Test organism: Strain 63.
Test dose given 14 days after vaccine injection.

When groups of mice of the same weights but regardless of age were examined, similar results were obtained. Healthy mice of a given weight varied little in age among the strains studied.

(*c*) *Sex of mice.*—Tests to determine the influence of sex on the susceptibility and immunizability of mice gave varying results. Differences between results obtained in male or female mice were slight and not predictable. In order to avoid this possible factor, equal numbers of the two sexes among the control and immunized animals were used in most experiments.

TABLE 4.—*Influence of the number of mice used on each test dilution on results of vaccine potency tests*

Vaccine	Test dilution	Result (Survivors/number of mice injected)						
		Number of mice in group						
		3	5	7	8	10	12	15
"Y" 0.05 cc. per mouse.	10^{-2}	0/3	0/5	0/7	0/8	0/10	0/12	0/15
	10^{-3}	0/3	0/5	0/7	0/8	0/10	0/12	0/15
	10^{-4}	2/3	3/5	2/7	5/8	4/10	5/12	7/15
	50 percent end point number lethal doses resisted.	>3,200	10,000	>2,000	>6,200	>2,000	>3,200	>2,500
"X" 0.05 cc. per mouse.	10^{-2}	0/3	0/5	0/7	0/8	0/10	0/12	0/15
	10^{-3}	2/3	5/5	5/7	7/8	7/10	10/12	12/15
	10^{-4}	2/3	4/5	7/7	6/8	9/10	11/12	13/15
	50 percent end point number lethal doses resisted.	18,000	170,000	39,000	75,000	31,000	70,000	50,000
Controls, no vaccine.	10^{-6}	0/3	0/5	1/7	0/8	1/10	1/12	1/15
	10^{-7}	1/3	0/5	2/7	1/8	3/10	2/12	3/15
	10^{-8}	3/3	3/5	6/7	6/8	9/10	9/12	12/15
	50 percent end point log of dilution=1 lethal dose.	7.250	7.833	7.290	7.590	7.282	7.510	7.413

Test organism: Strain 63.
Regular strain mice, 14–16 gm.
Tested 14 days after vaccination.]

(*d*) *Number of mice on test.*—Variations in results of potency tests occurred when groups of varying numbers of mice were immunized with the same vaccines. These differences are shown in table 4. Vaccine "Y" was of low potency and in most groups of mice 50 percent end points were not reached. Results varied from 10,000 lethal dose protection when 5 mice were used to less than 2,000 lethal dose protection when 10 mice were used. Vaccine "X" was a potent vaccine and results varied from 170,000 lethal dose protection when 5 mice were used to 18,000 lethal dose protection when 3 mice were used. On the basis of results obtained when 15 mice were employed per dilution smaller groups of mice would not be expected to give as consistent results. Results were definitely more erratic when less than 10 mice per test dilution were employed.

2. MUCIN

Lots of mucin may vary in their ability to enhance the lethal action of organisms (*14*). Four lots of granular mucin were employed in tests at various times with equally satisfactory results. Likewise, mucin suspensions were satisfactory when sterilized by a single 20-minute period under 15 pounds pressure, or in the Arnold sterilizer for 30-minute periods on 3 successive days (*5*).

3. TEST ORGANISM

(*a*) *Strain.*—Strain 63 was used in tests over a 3-year period and its stability with regard to lethal action in nonimmunized mice is shown in table 5. In addition to producing consistent results in mice

TABLE 5.—*The virulence of test strain 63 when tested at different periods in nonimmunized mice*

Date	Number deaths/number mice injected			Log of dilution 50 percent mortality	Pour plate colony count—0.5 cc. of 10^{-7} dilution
	Test dilution				
	10^{-6}	10^{-7}	10^{-8}		
Sept. 2, 1941	15/15	12/15	6/15	7.680	45
Oct. 13, 1941	14/15	12/15	3/15	7.459	55
Nov. 18, 1941	12/15	11/15	6/15	7.476	86
Dec. 16, 1941	10/10	7/10	5/10	7.473	69
Jan. 6, 1942	12/12	11/12	5/12	7.793	57
Jan. 16, 1942	10/10	9/10	4/10	7.760	56
Feb. 10, 1942	13/13	11/13	3/13	7.555	45
Apr. 23, 1942	10/10	9/10	4/10	7.760	36
June 18, 1942	8/10	7/10	3/10	7.357	89
Dec. 12, 1942	7/10	4/10	2/10	6.757	41
Jan. 15, 1943	10/10	7/10	1/10	7.350	66
Feb. 9, 1943	7/8	4/8	2/8	7.166	70
July 30, 1943	8/10	5/10	2/10	7.000	77
Aug. 13, 1943	9/10	7/10	3/10	7.428	61
Sept. 15, 1943	8/10	8/10	2/10	7.377	
Oct. 14, 1943	9/10	5/10	3/10	7.185	59
Nov. 15, 1943	8/10	7/10	5/10	7.552	65
Dec. 21, 1943	7/10	8/10	5/10	7.511	58
Jan. 13, 1944	9/10	8/10	3/10	7.524	55
Feb. 12, 1944	7/9	8/10	5/9	7.685	105

Mice: Regular strain. Weight at time of test 18–20 gm.

this strain had the advantage of not being homologous with vaccine producing strains.

Two other virulent strains of typhoid bacilli (Nos. 26 and 23) were used in comparative tests (table 6) and it was apparent that vaccine made from strain 58 immunized mice against each of the three challenge organisms.

TABLE 6.—*Influence of strain of test organism on the potency of typhoid vaccine*

Challenge strain	Results (Survivors/number mice injected)							Log of dilution 50 percent mortality	Number 50 percent lethal doses resisted by mice given vaccine
	Given 0.05 cc. vaccine "A"			No vaccine					
	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}		
T23	1/9	5/9	9/9	1/10	1/10	2/10	7/9	7.383	37,000
T26	2/9	7/9	6/9	1/10	2/10	3/10	7/10	7.285	68,000
T63	1/9	4/9	5/9	0/10	2/10	3/9	4/9	7.793	23,000

Mice: Regular strain, weighing 14–16 gm. at beginning of test.
Tested 14 days after vaccine injection.

(*b*) *Number of organisms in test doses.*—Suspensions of test organisms were standardized by matching with a silica standard and the number of organisms present in the 10^{-7} dilution from the original suspension was reasonably consistent on various dates as shown by pour plate colony counts and by the calculated 50-percent lethal dose for mice (table 5).

The number of typhoid organisms used in testing the potency of vaccine in immunized mice was limited by the fact that doses containing more than approximately 50 million organisms in mucin (10^{-1} dilution) were toxic to such an extent that mice given large doses of vaccine or a dose of high titered immune rabbit serum failed to survive this severe test dose. Test doses from the 10^{-2} dilution downward were used in order to avoid this toxic factor.

4. VACCINES

(*a*) *Size of the immunizing dose.*—The size of the immunizing dose of vaccine markedly influenced the number of lethal doses mice resisted (table 7).

TABLE 7.—*Effect of dose of vaccine on the number of lethal doses resisted by mice*

Vaccine	Dose of vaccine (cc.)	Results: Number survivors/number mice injected—test dilutions								Number 50 percent lethal doses resisted
		10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	
MS	0.25	0/10	4/10	10/10	10/10	------	------	------	------	41,000
	.05	------	1/10	3/10	7/10	7/10	------	------	------	6,000
	.01	------	------	0/10	1/10	3/10	7/10	------	------	100
	.002	------	------	------	1/10	2/10	2/10	4/10	------	5
A	.5×2	0/10	9/10	10/10	------	------	------	------	------	740,000
	.25	0/10	7/10	9/9	------	------	------	------	------	470,000
	.05	------	4/9	6/9	10/10	------	------	------	------	45,000
	.01	------	------	1/9	5/10	7/9	7/10	------	------	1,000
	.002	------	------	------	1/10	4/10	7/10	7/10	------	75
	.0004	------	------	------	0/10	0/10	3/10	3/10	------	3
Rawlings	.5×2	------	0/10	0/10	0/10	3/10	8/10	------	------	100
	.25	------	------	0/10	1/9	1/9	3/9	6/9	------	12
	.05	------	------	------	1/10	1/9	3/9	4/9	------	7
Controls	No vaccine	------	------	------	------	0/10	1/10	3/10	7/10	(1)

[1] 50 percent lethal doses=7.432.

Mice: Regular strain, weighing 14-16 gm. Tested 14 days after vaccine injection.
Test organism: Strain 63.

A single dose of 0.25 cc. of vaccine "A" protected 50 percent of mice against several hundred thousand lethal doses, whereas 0.01 cc. failed to protect mice against the larger test doses. The relationship between amount of vaccine injected and number of lethal doses resisted by vaccinated mice did not appear to be linear. The curve was flattened in the range of the larger immunizing doses (fig. 1) and this leveling was due perhaps to limitations imposed by the toxicity of larger test doses.

Figure 1 illustrates curves obtained when numbers of lethal doses resisted by immunized mice are plotted according to the amount of vaccine injected. The curve representing Vaccine "A" illustrates that 2 doses of 0.5 cc. each, at a 7-day interval, did not cause a proportionate increase in the level of immunity over that induced in

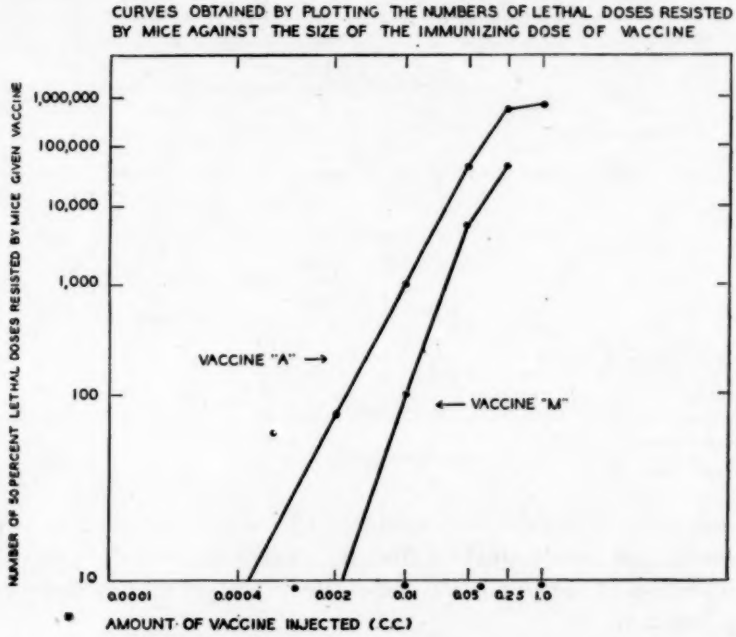

FIGURE 1.—Curves obtained by plotting the numbers of lethal doses resisted by mice against the size of the immunizing dose of vaccine.

mice by a single dose of 0.25 cc. of vaccine. Vaccine "M5" was one which was consistently of lower potency than vaccine "A."

(*b*) *Route of injection of the vaccine.*—Mice were immunized successfully with typhoid vaccine when injected subcutaneously, intravenously, or intraperitoneally. The number of lethal doses resisted by mice was greatest in the group vaccinated intraperitoneally, intermediate in the intravenously vaccinated group, and least in the subcutaneously vaccinated group.

(*c*) *Number of doses.*—Stimulating effects of a second or third dose of vaccine were noted among 3 groups of mice which received the same total amount of vaccine given in 1, 2, or 3 injections. Mice receiving the immunizing dose in 2 or 3 injections resisted larger test doses than those getting 1 injection of vaccine. A single injection of vaccine avoided the possible confusing effects of secondary stimulation on the results of potency tests.

5. INTERVAL BETWEEN IMMUNIZATION AND CHALLENGE

Mice exhibited immunity to the smaller test doses 1 day after vaccine was injected, as illustrated in table 8. The number of lethal doses resisted by mice was considerably greater on the third day after

TABLE 8.—*Influence of interval between injection of vaccine and challenge test on the results of potency test of typhoid vaccine*

Number of days between vaccine and test	Results Number survivors/number mice injected—test dilutions								Number of 50 percent lethal doses resisted by mice given vaccine
	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	
1	------	------	1/9	3/10	8/10	9/10	------	------	680
3	------	------	5/10	8/10	10/10	10/10	------	------	11,700
7	0/10	1/10	5/10	6/10	------	------	------	------	9,200
10	0/8	2/10	5/10	9/10	------	------	------	------	22,000
14	0/10	2/10	8/10	9/10	------	------	------	------	48,600
Controls (given 0.5 cc. saline containing 0.25 percent tricresol 1 day before test)	------	------	------	------	0/10	3/10	4/10	6/10	------

Vaccine: Vaccine "A," 0.05 cc.
Mice: Regular strain, weighing 14-16 gm. at injection.
Organism: Strain 63.

immunization. Results obtained on the third and on the seventh days were not significantly different. Tests at 10 and 14 days after the injection of vaccine gave consistently higher values than at the 7-day interval.

COMPARISON OF VACCINES BY VARIOUS METHODS OF TESTING

Anti-invasive properties produced in mice by the injection of typhoid vaccine were measured quantitatively by two methods: (1) Mice given a constant dose of vaccine (0.05 cc. of the finished vaccine) were tested with various dilutions of the test organism, in which instance the result was expressed in numbers of lethal doses mice were enabled to resist; (2) groups of mice given varying amounts of vaccine were challenged with a constant test dose of organisms, and results were expressed as the least amount of vaccine necessary to protect mice against a specified challenge dose of organisms. The evaluation of 10 vaccines by these two methods gave comparable results as to the relative potency of each vaccine as an immunizing agent (table 9).

The same vaccines were injected into rabbits, and the serums of these animals were used in 2 types of passive protection tests. Results of passive immunity tests did not agree with the values assigned the vaccines by active immunization tests. Vaccine "B" made from the

TABLE 9.—*Comparative tests of potency of 10 vaccines*

Vaccine	Description of vaccine	Active immunization tests				Passive immunization tests (serums of vaccinated rabbits)				Agglutinin titer of serums of rabbits given vaccine		
		Number 50 percent lethal doses resisted by mice given 0.05 cc. of vaccine		Amount vaccine required to protect 50 percent of mice against 10,000 lethal doses of *E. typhosa*		Number 50 percent lethal doses resisted by mice given 0.1 cc. of serum		Amount serum required to protect 50 percent of mice against 10,000 lethal doses of *E. typhosa*		O	H	Vi
		Number lethal doses resisted	Relative potency [1]	Amount of vaccine (cc.)	Relative potency [1]	Number lethal doses resisted	Relative potency [1]	Amount of serum (cc.)	Relative potency [1]			
A	Prepared at NIH, strain 58, heat killed, tricresol preserved.	40,000	100	0.005	100	224,000	100	0.05	100	400	3200	10
B	Prepared at NIH, Rawlings strain, heat killed, tricresol preserved.	[2]	0.025	.25	2	24,000	10	.06	80	400	3200	10
C	Commercial	1,000	2.5	.05	10	100,000	45	.015	330	800	3200	20
D	Commercial	1,100	3.6	.035	15	175,000	80	.055	90	1600	3200	20
E	Commercial	5,500	14.0	.025	20	265,000	120	.025	200	800	1600	10
F	Commercial	13,000	30.0	.008	68	269,000	120	.025	200	1600	3200	10
G	Prepared at NIH, strain 58, killed with 75 percent alcohol, preserved with 22.5 percent alcohol.	88,000	220	.002	250	147,000	65	.017	300	800	1600	10
H	Commercial	19,000	51	.022	25	317,000	140	.014	350	800	3200	10
I	Commercial	17,000	40	.03	20	127,000	57	.014	350	800	1600	2
J	Commercial	400	10	.05	10	100,000	45	.04	120	1600	3200	20

[1] Value arbitrarily assigned to vaccine "A"—100.
[2] Less than 10.

Rawlings strain gave the lowest value on active or passive tests, yet marked differences between this and other vaccines were demonstrated by the active immunization tests. It was evident also that vaccine "G," having the highest value in tests of active immunity, was mediocre in passive immunity tests. A possible explanation of this finding was that other immunity factors contributed to the protection of actively immunized mice while in passive protection tests serum antibody levels alone were being measured.

The "O" agglutinin titers of the rabbit serums were not in agreement with results of either active or passive tests of the efficacy of vaccines except that the "O" titer of rabbits given vaccine "B" (Rawlings strain) was low. All vaccines produced relatively high "H" agglutinin titers, and the lack of significance of this titer in relation to protective ability was indicated by the high value produced by the Rawlings strain of vaccine. The "H" titers indicated in the table corresponded to values obtained by tests which were formerly used to determine potency of typhoid vaccine.

Agglutinins for *S. ballerup* (Vi) were produced in low titer by all vaccines without any correlation to ability of serums to protect mice. The low Vi titers obtained, even with the alcohol-killed vaccine, agreed with the finding of Felix that vaccines given subcutaneously fail to raise Vi agglutinins in rabbits.

Of the vaccines examined, vaccine "G" (made with strain 58 according to the method recommended by Felix (*11*) in which alcohol was used to kill the organisms) gave very high values on active immunization tests. Vaccine "G" and vaccine "A" were products of the same lot of vaccine, differing only in the agents used in killing and preserving the organisms.

DISCUSSION

The potency of typhoid vaccines as measured by active immunization of mice is influenced by a number of factors. In order that potency tests at various times and in different laboratories may be comparable several parts of the test procedure should be standardized. The use of a stable standard vaccine to be used in immunizing mice concurrently with the assay of vaccine of unknown potency would appear to be indicated for the control of the variable factors of the test. At the present time no such standard exists and it therefore becomes important to attempt to control factors known to influence the results of potency tests.

The strain of mice used should be fully susceptible to *E. typhosa* since the number of lethal doses resisted by immunized mice is influenced by the susceptibility of mice. The age and weight of mice should be uniform and, although differences in the sex of mice ap-

peared to be slight, this factor may influence the results. A sufficient number of mice should be used to give consistent results.

The test organism should be virulent for mice and the basic suspension of organisms should contain approximately the same number of organisms for each test. Furthermore, cultures of a definite age should be used in order to obtain uniformity of results.

Due to the inability of mice to tolerate large toxic doses of organisms, it is difficult to demonstrate differences in the potency of vaccines when doses of 0.25 cc. or more of vaccine are given mice. Smaller doses of vaccine produce immunity in mice below the level at which the toxic doses need to be used to demonstrate protection. Differences in the potency of vaccine can be shown with small immunizing doses. The vaccine should be given in one dose to avoid the effect of the secondary stimulation, and it should be given by the same route in all tests. A definite time interval between injection of vaccine and challenge with typhoid bacilli should be established.

SUMMARY

The ability of typhoid vaccine to immunize mice against typhoid bacilli may be measured quantitatively. A suggested procedure for measuring the potency of typhoid vaccine, in which factors influencing the results of tests are thought to be minimized, follows:

Each of 30 or more mice of any susceptible strain, 6–8 weeks old and weighing 14–16 gms., is given 0.5 cc. of a 1:10 dilution of the vaccine intraperitoneally. Equal numbers of male and female mice should be used in each group. Fourteen days after the injection of vaccine the mice are divided into 3 groups of not less than 10 mice each, one group to receive approximately 100,000, one group approximately 10,000, and the third group approximately 1,000 lethal doses of virulent typhoid bacilli (16–20 hours old) suspended in 5 percent mucin.

At the time of the challenge, not less than 30 mice (set aside at the time of injecting mice with vaccine) of the same strain, age, weight, and equally distributed as to sex, are divided into 3 groups of not less than 10 mice each. These groups are given doses of typhoid organisms suspended in mucin so that in one group the majority of mice die, in another the majority survive. These mice serve to determine the lethal dose which shall be the greatest dilution which kills 50 percent or more of mice tested. Pour plate colony counts are made to determine the number of organisms present, and in this fashion the virulence of the test organism is checked. The virulence of a test strain should be such that not over 100 organisms suspended in mucin are required to kill 50 percent of mice. All challenged mice should be observed for 72 hours.

The requirement that 0.05 cc. of vaccine protects at least 50 percent of mice against not less than 10,000 lethal doses should be established.

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THE ISOLATION OF A FILTER-PASSING AGENT FROM THE RABBIT TICK *HAEMAPHYSALIS LEPORIS-PALUSTRIS* PACKARD [1]

By Edward A. Steinhaus, *Associate Bacteriologist*, and R. R. Parker, *Director, Rocky Mountain Laboratory, United States Public Health Service*

In connection with the study of certain tick-borne disease agents in southern Texas, two strains of an unidentified filter-passing agent, presumably a virus, were isolated from 2 separate lots of rabbit ticks,[2] *Haemaphysalis leporis-palustris*, collected in July 1943 in connection with a study of infectious agents resident in the tick population of Camp Bullis, near San Antonio, Tex., being made by the United States Public Health Service at the request of the Surgeon General's Office

[1] Contribution from Rocky Mountain Laboratory of the Division of Infectious Diseases, National Institute of Health.

[2] The rabbit ticks from which this disease agent was recovered were collected by Principal Sanitary Technician James M. Brennan, of the Office of the Post Surgeon, Col. Robert H. Duenner, Fort Sam Houston, Tex.

of the United States Army. Strain No. 1 was isolated from a lot of 1 nymph and 32 adult ticks injected subcutaneously and intradermally into a guinea pig. Strain No. 2 was similarly isolated from a lot consisting of 36 adults and 10 nymphs. Three other small lots tested from this area gave negative results.

Guinea pigs, mice, and rabbits were susceptible to the agent, though of the three animals, the guinea pig appeared to give the most distinct reaction. This animal was susceptible when inoculated subcutaneously, intraperitoneally, intracerebrally, or when infectious material was given orally. After an incubation period of 4 to 10 days, infected guinea pigs usually showed a fever for 2 to 6 days with temperatures varying from 39.6° to 40.4° C. The infection was never fatal, and, when sacrificed at the height of the fever, the autopsied animals showed very little gross evidence of disease. In fact, the only consistent finding was an enlargement of the spleen to about one and one-half to three times its normal size. Peculiar raised areas were observed frequently on the surface of the spleen. Occasionally there was some involvement of the inguinal and axillary lymph nodes.

Several "legs" of the 2 strains were maintained in guinea pigs for 9, 11, 13, 16, 17, and 23 consecutive transfers.

No cross immunity was noted between this agent and those of Rocky Mountain spotted fever or American Q fever.

Attempts to cultivate the agent on artificial media (North's gelatin chocolate blood agar, cystine-heart-agar, and Noguchi's leptospira medium) were unsuccessful. On the other hand, it was maintained in fertile hen's eggs for eight passages, killing 30 to 50 percent of the embryos. The agent grown in eggs was filterable through Seitz and Berkefeld filters.

Smears of animal and egg tissues revealed no recognizable organism when stained by Gram's, Macchiavello's, or Giemsa's staining methods.

DEATHS DURING WEEK ENDED OCTOBER 28, 1944

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Oct. 28, 1944	Corresponding week, 1943
Data for 93 large cities of the United States:		
Total deaths	8,998	8,932
Average for 3 prior years	8,568	
Total deaths, first 43 weeks of year	386,218	393,647
Deaths under 1 year of age	629	651
Average for 3 prior years	642	
Deaths under 1 year of age, first 43 weeks of year	26,669	28,455
Data from industrial insurance companies:		
Policies in force	66,836,251	65,993,760
Number of death claims	13,211	12,418
Death claims per 1,000 policies in force, annual rate	10.3	9.8
Death claims per 1,000 policies, first 43 weeks of year, annual rate	10.0	9.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED NOVEMBER 4, 1944

Summary

Although continuing the decline interrupted only once in the past 8 weeks, the current incidence of poliomyelitis, 451 cases, is above that for any corresponding week since 1930. Increases occurred in only 4 of the 11 States reporting more than 9 cases each, as follows (last week's figures in parentheses): *Increases*—Ohio 31 (25), Michigan 24 (19), Missouri 13 (12), California 17 (15); *decreases*—New York 145 (182), New Jersey 17 (30), Pennsylvania 34 (36), Illinois 23 (27), Minnesota 12 (24), Maryland 16 (17), North Carolina 18 (21). The total for the year to date is 17,888, as compared with a 5-year median of 8,170, and 11,379 for the same period last year, which was 91 percent of the total for that year.

Of the total of 145 cases of meningococcus meningitis, New York reported 18, Pennsylvania and Ohio 15 each, and California 9. The cumulative total to date is 14,626, as compared with 15,573 last year and a 5-year median of 1,735 for the corresponding periods.

A total of 2,474 cases of scarlet fever was reported during the current week, as compared with a 5-year median of 2,556 and last week's total of 2,412. The latter figure is the only weekly total recorded since August that was above the respective 5-year median.

The current figure for influenza, 1,612, as compared with last week's total of 1,549 and a 5-year median of 1,429, is slightly above the total for any corresponding week of the past 5 years. The cumulative total since the week ended August 12, the week of lowest incidence this year, is 11,065, as compared with 11,493 for the same period last year and a 5-year median of 10,781.

Current reports of diphtheria, measles, smallpox, typhoid fever, and whooping cough are below the respective 5-year medians.

Deaths recorded for the week in 91 large cities of the United States totaled 8,902, as compared with 8,929 last week and 8,450 for the 3-year (1942–43) average. The cumulative total to date is 391,861, as compared with 399,120 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended November 4, 1944, and comparison with corresponding week of 1943 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1939–43	Week ended—		Median 1939–43	Week ended—		Median 1939–43	Week ended—		Median 1939–43
	Nov. 4, 1944	Nov. 6, 1943		Nov. 4, 1944	Nov. 6, 1943		Nov. 4, 1944	Nov. 6, 1943		Nov. 4, 1944	Nov. 6, 1943	
NEW ENGLAND												
Maine	0	1	1	1	1	------	3	64	55	0	3	0
New Hampshire	0	0	0	------	------	------	0	16	2	0	1	0
Vermont	0	0	0	------	------	------	1	19	19	0	1	0
Massachusetts	5	2	2	------	------	------	54	157	165	8	7	2
Rhode Island	2	3	1	19	------	------	0	22	10	0	1	1
Connecticut	3	1	1	1	2	2	18	14	14	6	2	1
MIDDLE ATLANTIC												
New York	9	9	13	[1] 5	[1] 4	[1] 4	23	135	135	18	42	2
New Jersey	4	1	7	------	7	6	12	182	19	6	8	1
Pennsylvania	5	8	13	5	3	1	33	143	143	15	14	3
EAST NORTH CENTRAL												
Ohio	12	15	21	2	2	11	11	386	34	15	9	2
Indiana	4	32	22	2	12	12	3	80	10	2	5	2
Illinois	3	9	27	1	2	8	8	39	38	8	14	1
Michigan [2]	18	10	7	3	4	2	13	232	127	4	5	1
Wisconsin	9	4	2	7	12	24	11	334	110	6	2	1
WEST NORTH CENTRAL												
Minnesota	25	9	4	1	------	------	5	407	9	5	2	1
Iowa	17	8	8	------	------	1	1	17	25	2	0	0
Missouri	3	3	5	------	------	------	1	6	5	5	1	1
North Dakota	6	1	2	------	4	------	1	109	4	0	0	0
South Dakota	2	7	3	------	------	------	3	68	4	0	0	0
Nebraska	0	3	3	------	1	1	4	3	3	1	1	0
Kansas	2	9	5	2	1	2	5	2	5	0	1	1
SOUTH ATLANTIC												
Delaware	0	0	0	------	------	------	1	12	3	0	1	0
Maryland [2]	2	7	6	1	2	5	1	14	14	5	6	0
District of Columbia	0	0	1	------	------	------	2	5	0	2	2	0
Virginia	15	13	25	80	115	70	5	214	20	1	4	1
West Virginia	6	8	10	------	2	6	3	30	7	1	2	1
North Carolina	27	29	65	15	9	2	6	41	41	3	3	0
South Carolina	10	19	28	357	272	293	3	63	3	0	1	1
Georgia	29	25	25	50	25	25	2	11	2	0	1	1
Florida	17	8	8	2	3	3	11	26	3	2	2	0
EAST SOUTH CENTRAL												
Kentucky	12	12	16	------	5	5	0	5	14	2	7	2
Tennessee	8	16	16	1	30	14	3	8	8	0	2	1
Alabama	35	11	23	27	61	42	1	25	5	3	3	1
Mississippi [2]	28	12	14	------	------	------	------	------	------	3	5	1
WEST SOUTH CENTRAL												
Arkansas	27	5	19	66	11	31	6	2	2	2	0	0
Louisiana	17	6	14	------	3	3	1	2	1	1	5	0
Oklahoma	20	5	15	57	17	31	9	14	1	1	1	0
Texas	63	46	47	785	638	602	29	34	28	7	9	2
MOUNTAIN												
Montana	2	1	0	5	4	4	2	57	19	1	0	0
Idaho	3	0	0	------	------	------	3	0	5	0	0	0
Wyoming	2	0	0	------	4	4	3	7	4	0	0	0
Colorado	3	5	5	29	21	14	11	32	24	0	1	0
New Mexico	8	0	0	1	------	------	0	1	2	0	0	0
Arizona	4	2	4	60	113	68	0	8	8	1	2	0
Utah [2]	0	0	0	------	------	3	11	6	6	0	0	0
Nevada	0	0	0	2	------	------	2	9	0	0	1	0
PACIFIC												
Washington	20	3	5	------	------	------	11	26	26	1	4	2
Oregon	9	0	0	5	17	17	42	22	22	1	5	2
California	22	35	18	20	22	27	191	53	53	9	7	2
Total	518	403	619	1,612	1,429	1,429	569	3,162	1,771	147	193	33
44 weeks	10,752	11,115	12,632	349,179	92,654	157,887	596,558	554,188	476,152	14,628	15,573	1,735

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended November 4, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1939–43	Week ended—		Median 1939–43	Week ended—		Median 1939–43	Week ended—		Median 1939–43
	Nov. 4, 1944	Nov. 6, 1943		Nov. 4, 1944	Nov. 6, 1943		Nov. 4, 1944	Nov. 6, 1943		Nov. 4, 1944	Nov. 6, 1943	
NEW ENGLAND												
Maine	2	0	0	21	19	12	0	0	0	0	0	1
New Hampshire	1	2	1	7	9	7	0	0	0	0	0	0
Vermont	0	0	0	6	8	3	0	0	0	0	0	0
Massachusetts	8	8	3	107	140	140	0	0	0	2	3	2
Rhode Island	0	3	0	7	9	4	0	0	0	0	1	0
Connecticut	8	5	0	23	30	30	0	0	0	0	1	1
MIDDLE ATLANTIC												
New York	145	16	16	185	213	178	0	0	0	8	3	8
New Jersey	17	3	4	43	48	62	0	0	0	2	2	3
Pennsylvania	34	4	8	161	183	166	0	0	0	3	2	8
EAST NORTH CENTRAL												
Ohio	31	2	9	226	290	227	0	0	0	4	2	6
Indiana	5	1	2	62	72	51	0	1	1	1	1	2
Illinois	23	23	20	128	127	186	0	0	0	4	1	2
Michigan [2]	24	7	11	144	118	118	2	1	1	0	2	3
Wisconsin	7	8	5	78	152	125	1	0	0	0	1	1
WEST NORTH CENTRAL												
Minnesota	12	7	7	46	84	68	0	0	0	0	0	0
Iowa	6	2	2	40	61	55	0	1	1	2	0	0
Missouri	13	2	2	31	46	48	0	0	0	3	2	5
North Dakota	0	1	0	9	14	12	0	0	1	0	0	0
South Dakota	0	1	1	19	19	19	0	1	1	0	0	0
Nebraska	1	3	4	25	23	15	0	0	0	0	0	0
Kansas	4	8	4	93	80	60	0	2	1	2	1	1
SOUTH ATLANTIC												
Delaware	2	0	0	0	2	6	0	0	0	0	0	0
Maryland [2]	16	0	1	58	54	44	0	0	0	0	1	5
District of Columbia	0	0	0	20	9	10	0	0	0	1	0	0
Virginia	8	1	1	61	72	53	0	0	0	1	11	5
West Virginia	4	1	2	80	70	70	0	0	0	3	0	3
North Carolina	18	1	1	106	159	102	0	0	0	4	0	4
South Carolina	1	2	1	18	11	17	0	0	0	1	2	3
Georgia	3	0	0	37	30	30	0	0	0	0	9	7
Florida	4	1	1	8	13	7	0	0	0	1	6	3
EAST SOUTH CENTRAL												
Kentucky	9	2	5	48	68	64	0	0	0	5	1	11
Tennessee	2	0	0	23	59	59	0	0	0	2	1	1
Alabama	0	0	0	29	27	39	0	0	0	1	0	3
Mississippi [2]	2	0	0	20	14	14	0	0	0	2	3	1
WEST SOUTH CENTRAL												
Arkansas	0	0	2	30	8	11	0	0	0	13	1	9
Louisiana	2	3	2	17	8	8	0	0	0	4	1	4
Oklahoma	0	12	1	21	55	23	0	0	1	3	7	7
Texas	8	12	8	95	48	37	0	1	1	13	9	9
MOUNTAIN												
Montana	1	0	0	11	9	13	0	0	0	0	3	1
Idaho	0	0	0	40	16	13	0	0	0	0	0	0
Wyoming	0	0	0	5	6	5	0	0	0	0	0	0
Colorado	0	8	2	28	27	27	1	0	1	0	2	2
New Mexico	1	2	1	16	3	3	0	0	0	3	1	2
Arizona	0	1	0	7	27	2	0	0	0	1	0	1
Utah [2]	1	15	4	9	29	6	0	0	0	0	0	1
Nevada	0	0	0	1	2	1	0	0	0	0	0	0
PACIFIC												
Washington	9	15	3	42	100	39	0	0	0	1	1	1
Oregon	2	18	2	20	41	12	0	0	0	0	0	1
California	17	59	9	163	148	134	0	0	0	5	2	3
Total	451	259	259	2,474	2,860	2,556	4	7	8	95	83	159
44 weeks	17,888	11,379	8,170	162,990	116,334	116,334	340	655	1,252	4,883	4,910	7,578

[2] Period ended earlier than Saturday.

[3] Including paratyphoid fever cases reported separately as follows: Massachusetts, 2; New York, 2; New ersey, 2; Kentucky, 3; Arkansas, 1; Texas, 1; Arizona, 1; California, 1.

Telegraphic morbidity reports from State health officers for the week ended November 4, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Whooping cough			Week ended Nov. 4, 1944								
	Week ended—		Median, 1939–43	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Nov. 4, 1944	Nov. 6, 1943			Amebic	Bacillary	Unspecified					
NEW ENGLAND												
Maine	17	33	27	0	0	0	0	0	0	0	0	0
New Hampshire	0	3	3	0	0	0	0	0	0	0	0	0
Vermont	47	29	22	0	0	0	0	0	0	0	0	0
Massachusetts	95	98	168	0	0	3	0	0	0	0	0	0
Rhode Island	35	35	24	0	0	0	0	0	0	0	0	0
Connecticut	76	65	80	0	0	11	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	168	254	405	0	3	75	0	0	0	1	0	0
New Jersey	77	81	129	0	20	0	0	0	0	0	0	0
Pennsylvania	104	167	330	1	1	0	0	0	0	1	0	0
EAST NORTH CENTRAL												
Ohio	138	116	124	0	0	3	0	0	0	1	1	0
Indiana	1	28	26	0	0	0	0	1	0	0	0	0
Illinois	50	130	172	0	8	0	0	2	0	0	2	0
Michigan [3]	49	122	155	0	1	4	0	0	0	0	0	0
Wisconsin	73	193	174	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	42	53	53	0	3	0	0	1	0	0	0	0
Iowa	3	35	20	0	0	0	0	1	0	0	0	0
Missouri	19	13	13	0	0	0	1	0	0	0	0	0
North Dakota	10	6	15	0	0	0	0	0	0	0	0	0
South Dakota	6	5	6	0	0	0	0	0	0	0	0	0
Nebraska	12	13	6	0	0	0	0	0	0	0	0	0
Kansas	21	35	35	0	0	0	0	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	2	4	7	0	0	0	0	0	0	0	0	0
Maryland [3]	64	34	34	0	0	0	6	0	0	0	0	0
District of Columbia	6	6	11	0	0	0	0	0	0	0	0	0
Virginia	20	101	61	0	0	0	74	0	0	0	0	0
West Virginia	14	16	16	0	0	0	0	0	0	0	1	0
North Carolina	57	184	103	0	0	0	0	0	0	0	0	2
South Carolina	59	51	37	0	0	4	0	0	0	0	0	10
Georgia	6	11	16	0	1	1	0	0	0	0	0	25
Florida	28	27	12	0	1	1	1	0	0	0	0	14
EAST SOUTH CENTRAL												
Kentucky	15	63	64	0	0	0	0	0	0	0	2	0
Tennessee	11	29	29	0	0	0	1	0	0	0	1	0
Alabama	15	0	19	0	1	0	0	0	0	0	0	21
Mississippi [3]	----	----	----	0	0	0	0	0	0	0	0	8
WEST SOUTH CENTRAL												
Arkansas	32	13	17	0	1	11	0	0	0	0	0	0
Louisiana	0	2	6	0	0	0	0	0	0	0	0	7
Oklahoma	2	1	1	0	0	0	10	1	0	0	0	0
Texas	134	44	77	0	17	655	9	0	0	0	0	47
MOUNTAIN												
Montana	44	12	7	0	0	0	0	0	0	0	0	0
Idaho	5	8	6	0	0	0	0	0	0	0	0	0
Wyoming	2	10	8	0	0	0	0	0	0	0	0	0
Colorado	2	40	31	0	0	0	0	0	0	0	0	0
New Mexico	0	0	8	0	1	0	0	0	0	0	0	0
Arizona	3	11	8	0	0	0	22	0	0	0	0	0
Utah [3]	12	12	20	0	0	0	0	0	0	0	0	0
Nevada	0	2	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	15	63	53	0	0	0	0	0	0	0	0	0
Oregon	9	40	16	0	0	0	0	0	0	0	0	0
California	94	81	185	0	2	22	0	0	0	0	0	0
Total	1,694	2,379	2,804	1	60	790	124	6	0	3	6	134
Same Week 1943	2,379	----	----	2	29	255	82	5	0	2	17	128
Same Week 1942	2,804	----	----	1	16	207	58	18	2	4	4	100
44 Weeks 1944	81,128	----	----	38	1,584	20,540	7,747	570	27	447	478	4,426
44 Weeks 1943	159,207	----	----	58	1,808	14,237	6,756	597	24	427	706	3,716
44 Weeks 1942	152,531	----	[4]152,531	71	1,048	11,009	6,023	500	42	[4]449	748	[4]2,463

[3] Period ended earlier than Saturday.

[4] 5-year median 1939–43.

WEEKLY REPORTS FROM CITIES

City reports for week ended October 28, 1944

This table lists the reports from 89 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	-----	0	0	1	3	0	2	0	0	1
New Hampshire:												
Concord	0	0	-----	0	0	0	1	0	0	0	0	0
Vermont:												
Barre	0	0	-----	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston	0	0	-----	0	86	4	10	6	37	0	0	7
Fall River	0	0	-----	0	1	0	1	0	2	0	0	0
Springfield	0	0	-----	0	0	1	0	0	3	0	0	0
Worcester	0	0	-----	0	1	0	13	0	11	0	0	4
Rhode Island:												
Providence	0	0	1	0	1	1	4	1	7	0	0	2
Connecticut:												
Bridgeport	0	0	-----	0	0	0	1	0	0	0	0	2
Hartford	0	0	-----	0	0	1	2	0	1	0	0	4
New Haven	0	0	-----	0	0	0	1	2	5	0	0	10
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	0	1	1	0	8	1	3	0	0	0
New York	11	1	4	2	7	14	54	77	72	0	3	95
Rochester	0	0	-----	0	11	0	0	16	0	0	0	9
Syracuse	0	0	-----	0	0	0	2	2	1	0	0	2
New Jersey:												
Camden	0	0	-----	0	0	1	1	0	0	0	0	0
Newark	0	0	-----	0	1	0	5	1	7	0	0	4
Trenton	0	0	-----	0	0	0	0	6	1	0	0	0
Pennsylvania:												
Philadelphia	2	0	2	2	4	2	22	7	28	0	7	26
Pittsburgh	1	0	1	1	1	2	10	0	11	0	0	11
Reading	0	0	-----	0	0	0	1	0	0	0	0	0
EAST NORTH CENTRAL												
Ohio:												
Cleveland	0	0	1	0	1	4	3	1	33	0	0	18
Columbus	1	0	-----	0	0	0	4	0	6	0	0	4
Indiana:												
Fort Wayne	0	0	-----	0	0	0	2	0	2	0	0	0
Indianapolis	0	0	-----	0	1	1	6	1	3	0	0	3
South Bend	8	0	-----	0	0	0	0	0	2	0	0	1
Terre Haute	0	0	-----	0	0	0	3	0	0	0	0	1
Illinois:												
Chicago	0	0	3	0	4	8	18	12	42	0	2	26
Springfield	0	0	-----	0	2	1	3	2	1	0	0	0
Michigan:												
Detroit [1]	5	0	1	3	2	2	6	5	30	0	0	15
Flint	0	0	-----	0	1	0	0	0	3	0	0	0
Grand Rapids	0	0	-----	0	0	0	0	0	4	0	0	0
Wisconsin:												
Kenosha	0	0	-----	0	0	0	0	0	0	0	0	9
Milwaukee	0	1	-----	0	4	1	3	0	12	0	0	3
Racine	0	0	-----	0	1	0	0	0	11	0	0	8
Superior	0	0	-----	0	0	0	0	0	1	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	-----	0	0	0	3	2	6	0	0	6
Minneapolis	12	0	-----	0	0	0	4	10	5	0	0	5
St. Paul	0	0	-----	0	0	1	7	0	5	0	0	27
Missouri:												
Kansas City	0	0	-----	0	0	2	10	0	6	0	0	6
St. Joseph	0	0	-----	0	0	0	0	0	2	0	0	0
St. Louis	1	0	5	1	1	3	11	8	4	0	0	11

See footnotes at end of table.

City reports for week ended October 28, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0	------	0	0	0	1	0	0	0	0	0
Nebraska:												
Omaha	2	0	------	0	6	0	1	0	2	0	0	2
Kansas:												
Topeka	0	1	------	0	0	0	1	0	7	0	0	2
Wichita	0	0	------	0	1	0	0	0	1	0	0	0
SOUTH ATLANTIC												
Delaware:												
Wilmington	1	0	------	0	0	0	3	3	0	0	0	0
Maryland:												
Baltimore	6	0	2	2	3	1	7	4	22	0	0	70
Cumberland	0	0	------	0	0	0	0	0	0	0	0	0
Frederick	0	0	------	0	0	0	1	0	0	0	0	0
District of Columbia:												
Washington	0	0	2	0	2	2	7	6	14	0	0	6
Virginia:												
Lynchburg	0	0	------	0	0	1	0	5	1	0	0	0
Richmond	0	0	------	0	0	0	1	1	15	0	0	4
Roanoke	0	0	------	0	0	0	0	1	6	0	0	4
West Virginia:												
Charleston	0	0	------	0	0	0	0	0	4	0	0	0
Wheeling	0	0	------	0	0	0	1	0	3	0	0	0
North Carolina:												
Raleigh	0	0	------	0	0	0	0	0	1	0	0	1
Wilmington	6	0	------	0	1	0	0	0	5	0	0	0
Winston-Salem	0	0	------	0	2	0	2	0	4	0	0	3
South Carolina:												
Charleston	0	0	6	0	0	0	2	1	2	0	0	0
Georgia:												
Atlanta	0	0	------	0	0	0	2	2	6	0	0	3
Brunswick	0	0	------	0	0	0	2	0	1	0	0	0
Savannah	0	0	3	3	0	0	1	0	0	0	0	0
Florida:												
Tampa	4	0	------	0	0	0	2	0	2	0	0	1
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	2	1	4	1	13	1	13	0	0	9
Nashville	0	0	------	1	0	0	5	0	6	0	0	2
Alabama:												
Birmingham	0	0	1	0	0	0	7	0	3	0	0	0
Mobile	2	0	------	0	0	0	2	0	1	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	1	0	------	0	0	0	3	0	2	0	0	0
Louisiana:												
New Orleans	11	0	------	0	3	1	6	1	10	0	5	0
Shreveport	2	0	------	0	0	0	8	0	0	0	0	0
Texas:												
Dallas	2	0	------	0	2	0	1	0	4	0	0	5
Galveston	0	0	------	0	0	0	0	0	0	0	0	0
Houston	4	0	------	0	0	1	5	1	6	0	4	0
San Antonio	1	0	------	1	0	0	5	0	5	0	1	0
MOUNTAIN												
Montana:												
Billings	0	0	------	0	0	0	0	0	1	0	1	0
Great Falls	0	0	------	0	0	0	0	0	4	0	0	2
Helena	0	0	------	0	0	0	0	0	1	0	0	3
Missoula	0	0	------	0	0	0	0	0	1	0	0	0
Idaho:												
Boise	3	0	0	0	0	0	0	1	0	0	0	0

See footnotes at end of table.

City reports for week ended October 28, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
MOUNTAIN—continued												
Colorado:												
Denver	3	0	3	0	4	0	0	0	9	0	0	0
Pueblo	0	0	-----	0	0	0	0	0	3	0	0	0
Utah:												
Salt Lake City	0	0	-----	0	1	0	1	0	3	0	0	10
PACIFIC												
Washington:												
Seattle	1	0	-----	1	6	0	6	2	5	0	1	0
Spokane	1	0	2	2	10	0	1	0	2	0	0	0
Tacoma	0	0	-----	0	2	0	0	0	0	0	0	1
California:												
Los Angeles	11	0	4	1	9	2	8	6	32	0	0	8
Sacramento	0	0	-----	0	3	0	2	1	2	0	0	0
San Francisco	0	1	-----	1	15	1	6	2	9	0	0	1
Total	105	4	43	23	205	60	335	198	587	0	24	459
Corresponding week, 1943	84	-----	76	22	585	-----	345	-----	577	0	12	662
Average, 1939–43	86	-----	69	[3] 20	[3] 367	-----	[3] 315	-----	567	0	26	948

[1] Information has been received that the 29 cases of encephalitis reported in Detroit in recent months include post infectional (12), lymphocytic choriomeningitis (9), type undetermined (4), and infectious type (4), (including the St. Louis and equine types). A recent change in the State regulations groups all of the encephalitides and requires the reporting of all types.

[3] 3-year average, 1941–43.

[3] 5-year median, 1939–43.

Dysentery, amebic.—Cases: New York, 1; Chicago, 2; Topeka, 1.

Dysentery, bacillary.—Cases: New York, 24; Rochester, 8; Syracuse, 7; Cleveland, 3; Chicago, 1; Detroit, 5; St. Louis, 2; Baltimore, 1; Atlanta, 1; Los Angeles, 4.

Dysentery, unspecified.—Cases: Richmond, 1.

Leprosy.—Cases: New York, 1.

Typhus fever, endemic.—Cases: Charleston, S. C., 1; Savannah, 3; Tampa, 2; Nashville, 3; Birmingham, 2; Mobile, 6; New Orleans, 4; Dallas, 1; Houston, 5; San Antonio, 3.

Rates (annual basis) per 100,000 population, by geographic groups, for the 89 cities in the preceding table (estimated population, 1943, 33,926,300)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	0.0	0.0	2.6	0.0	233	20.9	94.1	23.5	178	0.0	0.0	78
Middle Atlantic	6.9	0.5	3.2	2.8	12	8.8	47.7	50.9	57	0.0	4.6	68
East North Central	9.0	0.6	3.2	1.9	10	10.9	30.9	13.5	96	0.0	1.3	58
West North Central	31.8	2.0	9.9	2.0	16	11.9	75.6	39.8	76	0.0	0.0	117
South Atlantic	27.8	0.0	21.2	8.2	13	6.5	50.7	37.6	141	0.0	0.0	150
East South Central	17.7	0.0	17.7	11.8	24	5.9	159.4	5.9	136	0.0	0.0	65
West South Central	60.3	0.0	0.0	2.9	14	5.7	80.3	5.7	77	0.0	28.7	14
Mountain	47.7	0.0	23.8	0.0	40	0.0	7.9	7.9	175	0.0	7.9	119
Pacific	20.6	1.6	9.5	7.9	71	4.7	36.4	17.4	79	0.0	1.6	16
Total	16.2	0.6	6.6	3.5	32	9.2	51.6	30.5	90	0.0	3.7	71

PLAGUE INFECTION IN SAN BERNARDINO COUNTY, CALIF., AND TACOMA, WASH.

Plague infection has been reported proved in a pool of 67 fleas from 7 ground squirrels, *C. fisheri*, taken Oct. 10 from Green Valley, 8 miles west of Big Bear Lake, San Bernardino County, Calif., and in a pool of 50 fleas from 23 rats, *R. norvegicus*, collected Oct. 23 at the waterfront, Tacoma, Wash.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended October 14, 1944.—During the week ended October 14, 1944, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		33		81	77	59	7	17	29	303
Diphtheria	1	4	3	59	6	3	8	1	1	86
Dysentery:										
Bacillary				29					3	32
Unspecified					2					2
Encephalitis, infectious						1			1	2
German measles				5	1		3		5	14
Influenza					4	1			3	8
Measles		1	3	100	46	12	19	1	24	206
Meningitis, meningococcus		1		2	6	1		1		11
Mumps		2		92	32	1	1	20	23	171
Poliomyelitis			1	1	[1] 20	1	2	2	3	[1] 30
Scarlet fever		15	20	136	83	14	3	29	26	326
Tuberculosis (all forms)		6	1	165	52	7		31	21	283
Typhoid and paratyphoid fever			11	30	2			1	1	45
Undulant fever				5						5
Venereal diseases:										
Gonorrhea	2	28	24	76	115	42	26	32	68	413
Syphilis	1	7	13	87	96	14	10	9	22	259
Whooping cough		20		158	35	9	2	31	21	276

[1] Includes 12 cases, delayed reports.

JAMAICA

Notifiable diseases—4 weeks ended October 21, 1944.—During the 4 weeks ended October 21, 1944, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	4	14	Puerperal fever		1
Diphtheria	1	2	Tuberculosis	36	42
Dysentery	33	17	Typhoid fever	13	76
Leprosy		3			

NEW ZEALAND

Notifiable diseases—4 weeks ended October 7, 1944.—During the 4 weeks ended October 7, 1944, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	31	3	Puerperal fever	8	
Diphtheria	75	4	Scarlet fever	674	1
Dysentery, bacillary	6		Tetanus	1	
Erysipelas	24		Trachoma	3	
Lead poisoning	1		Tuberculosis (all forms)	160	52
Malaria	64		Typhoid fever	15	
Ophthalmia neonatorum	1		Undulant fever	2	

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–August 1944	September 1944	October 1944—week ended—			
				7	14	21	28
ASIA							
Ceylon	C	2					
India	C	156,192	18,345				
Calcutta	C	3,087	166	39			
Chittagong	C	63					
Madras	C	36	1				
Negapatam	C	17					
Vizagapatam	C	269					

PLAGUE

[C indicates cases; D, deaths; P, present]

AFRICA							
Algeria	C	2	39		[1] 7		
Bechuanaland	C						P
Belgian Congo	C	4	8				
Plague-infected rats		P					
British East Africa:							
Kenya	C	6	5	1			
Uganda	C	5					
Egypt	C	639	2			2	
Port Said	C	71	2			1	
Suez	C	157				1	
French West Africa: **Dakar**	C	308	164	19	15		
Madagascar	C	80	5				
Morocco (French)	C	139	3				
Rhodesia, northern	C	1					
Senegal	C	29	12				
Tunisia	C	1	9			1	
Union of South Africa	C	23	13				
ASIA							
China:							
Chekiang Province	C		P				
Foochow	C	P					
Kiangsi Province	C	P	[2] 104				
India	C	7,252	455				
Indochina	C	57					
Palestine	C	20	24	8	6	6	
Plague-infected rats		53					

See footnotes at end of table.

PLAGUE—Continued

Place		January–August 1944	September 1944	October 1944—week ended— 7	14	21	28
EUROPE							
Portugal: Azores	C	14	6	----	3	2	----
SOUTH AMERICA							
Bolivia:							
Chuquisaca Department	C	5	----	----	----	----	----
Santa Cruz Department	C	5	----	----	----	----	----
Tarija Department	C	12	----	----	----	----	----
Brazil	C	94	----	----	----	----	----
Ecuador:							
Chimborazo Province	C	4	----	----	----	----	----
Loja Province	C	4	----	----	----	----	----
Peru:							
Ancash Department	C	57	----	----	----	----	----
Lambayeque Department	C	1	----	----	----	----	----
Libertad Department	C	5	1	----	----	----	----
Lima Department	C	17	3	----	----	----	----
Piura Department	C	2	----	----	----	----	----
OCEANIA							
Hawaii Territory:							
Hamakua District	D	[3] 5	----	----	----	----	----
Plague-infected rats [4]		[5] 49	1	----	----	----	----

[1] For the period Oct. 1–10, 1944.
[2] From the beginning of the outbreak in August 1944.
[3] Includes 1 death from pneumonic plague.
[4] 53 fleas were also proved positive for plague on Mar. 7, 1944.
[5] Includes 12 plague-infected mice. Plague-infected tissue in a pool of 8 mice was also reported during August 1944.

SMALLPOX

[C indicates cases; D, deaths; P, present]

AFRICA							
Algeria	C	794	14	----	----	----	----
Angola	C	35	----	----	----	----	----
Basutoland	C	201	----	----	----	----	----
Belgian Congo	C	1,385	441	----	----	----	----
British East Africa:							
Kenya	C	2,964	88	15	----	----	----
Mombasa	C	143	----	----	----	----	----
Tanganyika	C	2,624	----	----	----	----	----
Uganda	C	3,339	411	116	----	----	----
Cameroon (French)	C	365	2	----	----	----	----
Dahomey	C	85	3	----	----	----	----
Egypt	C	10,804	27	----	----	----	----
French Equatorial Africa	C	1,277	----	----	----	----	----
French Guinea	C	880	111	----	[1] 16	----	----
French West Africa	C	120	9	----	----	----	----
Gambia	C	13	----	----	----	----	----
Gold Coast	C	7	----	----	----	----	----
Ivory Coast	C	414	14	----	[1] 7	----	----
Mauritania	C	2	----	----	----	----	----
Morocco (French)	C	648	32	----	----	----	----
Mozambique	C	3	----	----	----	----	----
Nigeria	C	3,519	199	----	----	----	----
Niger Territory	C	554	28	----	----	----	----
Senegal	C	184	6	----	----	----	----
Sierra Leone	C	393	----	----	----	----	----
Sudan (Anglo-Egyptian)	D	1	----	----	----	----	----
Sudan (French)	C	1,894	32	----	[1] 34	----	----
Tunisia	C	6	----	----	----	----	----
Union of South Africa	C	353	105	----	----	----	----
ASIA							
Arabia	C	[2] 9	4	----	----	----	----
Ceylon	C	8	----	----	----	----	----
China: Kunming (Yunnan Fu)	C	53	----	----	----	----	----
India	C	224,040	6,179	----	----	----	----
Indochina	C	1,557	----	----	----	----	----
Iran	C	790	----	----	----	----	----
Iraq	C	32	6	3	1	----	----
Palestine	C	162	3	----	----	----	----
Syria and Lebanon	C	179	----	----	----	----	----

See footnotes at end of table.

SMALLPOX—Continued

Place		January–August 1944	September 1944	October 1944—week ended— 7	14	21	28
EUROPE							
France	C	1					
Gibraltar	C	P					
Great Britain	C	[3] 18					
Greece	C	321					
Italy	C	638	123	48	32		
Portugal	C	31	1				
Spain	C	166					
Turkey	C	5,628					
NORTH AMERICA							
Dominican Republic	C	1					
Guatemala	C	8	1				
Honduras	C	9					
Mexico	C	2,298					
Panama (Republic)	C		1				
SOUTH AMERICA							
Bolivia	C	754					
Brazil	C	610	138	29	2		
Chile	C						15
Colombia	C	341	19	3	3	2	
Ecuador	C	19					
Peru	C	236					
Lima	C	19					
Venezuela	C	314	54				

[1] For the period Oct. 1–10, 1944.
[2] Includes 4 imported cases.
[3] Includes 1 case imported from the Middle East.

TYPHUS FEVER

[C indicates cases]

AFRICA							
Algeria	C	1,120	53		[1] 8		
Basutoland	C	95					
Belgian Congo	C	16	16				
British East Africa: Kenya	C	7	5	1			
Egypt	C	16,727	135				
French Guinea	C	2					
French West Africa: Dakar	C	47	1				
Gold Coast	C	5					
Morocco (French)	C	2,330	52				
Morocco (Spanish)	C	8					
Mozambique	C	2					
Nigeria	C	2					
Rhodesia, northern	C	75					
Sierra Leone	C	30					
Sudan (Anglo-Egyptian)	C	2	1				
Tunisia	C	636	72				
Union of South Africa	C	5,458					
ASIA							
Arabia: Western Aden Protectorate	C	[2] 15					
Ceylon	C	1					
China: Kunming (Yunnan Fu)	C	77	25				
India	C	6	4				
Indochina	C	1,004					
Iran	C	6,425					
Iraq	C	578					
Palestine	C	442	23	12	1	1	
Syria and Lebanon	C	428					
Trans-Jordan	C	45					
EUROPE							
Belgium	C	10					
Bulgaria	C	686					
France	C	[2] 1					
Germany	C	215					
Greece	C	294					
Hungary	C	3,225	74	10			
Irish Free State	C	7					
Italy	C	7	2				
Netherlands	C	8					
Norway	C	1					
Portugal	C	4	4	2	1	3	
Rumania	C	6,000					
Slovakia	C	335					
Spain	C	463		2			
Turkey	C	2,286	48				
Yugoslavia	C	7,434					

See footnotes at end of table.

TYPHUS FEVER—Continued

Place		January–August 1944	September 1944	October 1944—week ended— 7	14	21	28
NORTH AMERICA [3]							
Costa Rica	C	2					
Dominican Republic	C	10					
Guatemala	C	1,703	117				
Jamaica	C	54					
Mexico	C	1,286					
Panama Canal Zone	C	1					
Puerto Rico (endemic)	C	160	11				
Salvador	C	4	3				
Virgin Islands	C	19					
SOUTH AMERICA							
Bolivia	C	192					
Brazil	C	4					
Chile	C	349	16				
Colombia	C	278	13				
Curacao	C	4	1		1		
Ecuador	C	253	23				
Peru	C	650					
Venezuela	C	72	10				
OCEANIA							
Australia	C	157		1			
Hawaii Territory	C	92		6	5		

[1] For the period Oct. 1–10, 1944.
[2] A report dated Mar. 30, 1944, states that an estimated 800 deaths from typhus fever have been reported in Western Aden Protectorate, Arabia.
[3] Cases of typhus fever listed in this area are probably of endemic type.

YELLOW FEVER

[C indicates cases; D, deaths]

AFRICA							
Belgian Congo:							
Babeyru	D	2					
Banzyville	C	[1] 13					
Bondo	D	1					
Leopoldville	C	1					
French Guinea: Kindia	C			1			
Gold Coast: [2]							
Cape Coast	C	[3] 1					
Kintampo	C	1					
Northern Territories	C	1					
Sekondi	C	[3] 1					
Tamale	C	[3] 1					
Yendi	C	[3] 1					
Ivory Coast: Abidjan	C	1					
Portugese Guinea: Port Bintam	C	1					
EUROPE							
Portugal: Lisbon.[4]							
SOUTH AMERICA							
Bolivia:							
La Paz Department	C	1					
Santa Cruz Department	C	3					
Brazil:							
Acre Territory	D	1					
Matto Grosso State	D	3					
Para State	D	2					
Colombia:							
Boyaca Department	D	2					
Caldas Department	D	1					
Cundinamarca Department	D	1					
Santander Department	D	4					
Venezuela: Tachira State	C		8			1	

[1] Includes 11 suspected cases of yellow fever.
[2] During the week ended Sept. 30, 1944, 1 case of yellow fever was reported in Gold Coast, no location being given.
[3] Suspected.
[4] According to information dated Jan. 21, 1944, it is reported that a vessel which called at the islands of Sao Tome and Cape Verde arrived at Lisbon, Portugal, with cases of yellow fever on board.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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